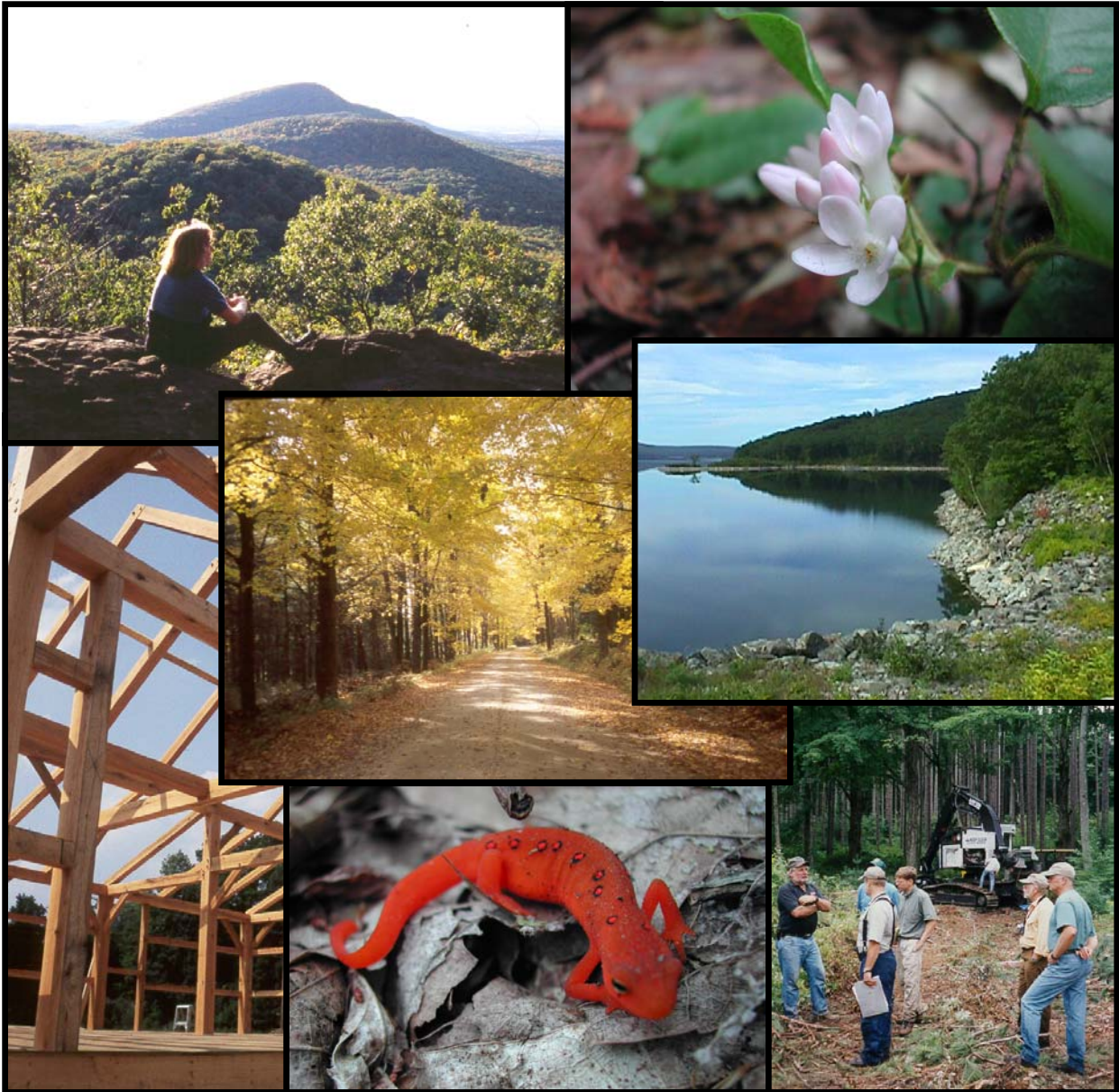


Landscape Assessment and Forest Management Framework:

Lower Worcester Plateau Ecoregion in Massachusetts



*Commonwealth of Massachusetts
Executive Office of Environmental Affairs
May, 2004*

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Cover photos by Thom Kyker-Snowman

Acronyms used in this document

BF – Board Feet
BMP – Best Management Practices
BOF – Bureau of Forestry
BTU – British Thermal Unit
CR – Conservation Restriction
CRI – Cultural Resource Inventory
CRM – Cultural Resource Management
CSW – Critical Supporting Watershed
DCR – Department of Conservation & Recreation
DEM – Department of Environmental Management
DEP – Department of Environmental Protection
DFW – Division of Fisheries & Wildlife
DSPR – Division of State Parks & Recreation
DWSP – Division of Water Supply Protection
EOEA – Executive Office of Environmental Affairs
EPA – United States Environmental Protection Agency
ER - Ecoregion
FCPA - Forest Cutting Practices Act
FIA – Forest Inventory & Analysis
FSC – Forest Stewardship Council
ft³ – cubic feet
GIS – Geographic Information Systems
HWA – Hemlock Woolly Adelgid
IPANE - Invasive Plant Atlas of New England
LWP – Lower Worcester Plateau
MassGIS – Massachusetts office of Geographic Information Systems
MDC - Metropolitan District Commission
MGL – Massachusetts General Law
MHC - Massachusetts Historical Commission
MMBF – Million Board Feet
MW – Mega-watt
MWRA - Massachusetts Water Resources Authority
NHESP – Natural Heritage & Endangered Species Program
ORV/ATV – Off-Road Vehicles/All Terrain Vehicles
ORW – Outstanding Resource Water
PILOT - Payment In Lieu Of Taxes
PMOA - Programmatic Memorandum of Agreement
SCS – Scientific Certification Systems
SFI – Sustainable Forestry Initiative
SLCP – Statewide Land Conservation Plan
TFC – Target Fish Community
TNC - The Nature Conservancy
USFS – United States Forest Service

Foreword

This document represents the first in a series of assessment and guidance documents that will be prepared for the major “ecoregions” of Massachusetts. The purpose of these documents is to evaluate the conditions, identify the issues, and generate lists of goals and recommendations that will help guide future forest management activities in those ecoregions. Representatives from the three primary state land management divisions jointly develop these documents, with substantial and valuable public input. As each ecoregion document is drafted, public meetings are held to solicit comment and input, and review copies are posted on the Massachusetts Executive Office of Environmental Affairs website (www.mass.gov/envir/), and advertised in the Environmental Monitor (www.mass.gov/envir/mepa/secondlevelpages/currentissue.htm). The state’s forests, reservations and wildlife management areas belong to the people of Massachusetts; we welcome and encourage the active participation of the public as we develop plans for the long-term sustainable management of those lands.

The organization of this document is largely based on the general categories proposed by the “Montreal Process,”¹ with some modifications. The document is organized into two main sections: the “descriptive” portion of the document includes subsections on: Conservation of Biological Diversity; Forest Conditions, Health and Productivity; Soil & Water Conservation; Regional and Global Considerations; and Socio-economic Factors. The “management” section includes: Issues, Goals and Recommendations; and A Forest Management Framework for Massachusetts.

The data used in this document came from a variety of sources. The information presented in Figures 2-10, 12, 15-17, 23-30, and 32-33, along with Tables 2,3 and 7-11 is from the Massachusetts Office of Geographic Information Services (MassGIS; www.mass.gov/mgis/). The Executive Office of Environmental Affairs’ Community Preservation Initiative (<http://commpres.env.state.ma.us>) provided the information on community build-out analyses used in Figure 31 and Table 10. The Massachusetts Division of Fisheries & Wildlife provided the data used in Figures 1 and 11, as well as Table 1, and also adapted information obtained from the Harvard Forest (Petersham, Massachusetts) for Figure 19. Data in Figures 13, 20-22, and Tables 5 and 6 came from the U.S. Forest Service’s Forest Inventory and Analysis (FIA) program. Figure 18 came from a report produced by the University of Massachusetts Department of Natural Resources Conservation for the Metropolitan District Commission. The information on invasive plants in Table 4 was derived from the Invasive Plant Atlas of New England (IPANE). Most of the information on the forest product industry in the ecoregion (Tables 12-15) came from Gordon Boyce of the Department of Conservation and Recreation’s Division of State Parks and Recreation. Finally, the Cultural Resources section was written by Tom Mahlstedt, also from the Division of State Parks and Recreation

The authors would like to acknowledge the contributions of the following people in the preparation of this document: Jeremy Bell (DFG), Scott Costello (EOEA), Andy Finton (TNC), Kristin Foord (EOEA), Sergio Harding (DFG), Frank Lowenstein (TNC), Bill Pula (DCR), Jim Rassman (DCR), Todd Richards (DFG), Bill Rivers (DCR), Loring Schwarz (TNC), Bethann Stanger (EOEA), Jim Stergios (EOEA), Rob Warren (TNC), the Miller’s River Environmental Center, and the many public reviewers (listed in Appendices I and II) who provided valuable input and suggestions.

¹ The Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests (“Montreal Process”) is a group of nations, international organizations and non-governmental organizations formed in 1994 to advance the conservation and sustainable management of temperate and boreal forests. In 1995, 11 countries endorsed a comprehensive set of criteria and indicators to achieve those goals for use by their respective policy-makers.

Executive Summary

The Lower Worcester Plateau ecoregion (LWP) covers approximately 681,632 acres in central Massachusetts, making it the second largest of the 14 ecoregions in the state. Parts or all of 51 communities, five counties and seven major river basins comprise the ecoregion. The region is considered a glaciated plain, with open high hills and elevations ranging from about 200-1350 feet. Soil types are predominantly sandy till, with deposits of sand/gravel/silt in the valleys. Precipitation averages 44 inches per year with a mean annual temperature of 48°F and a 156-day growing season. Water resources are abundant.

Based on climatic and physiographic characteristics, potential vegetation types in the LWP include hemlock-white pine-oak, maple-birch-beech and red oak-hardwood associations. The ecoregion lies within the transition zone between the Northern Hardwoods and the Central Hardwoods general forest types.

The LWP is largely rural, with almost 73% of its land area classified as forest. The past 20 years have seen about a two percent loss in forested area, almost a 10% loss in agricultural and open lands, and a 27% increase in developed land.

Presently, more than 37% of the LWP is in some form of “protected” status, although not all of this is permanently protected. State-owned properties amount to almost 134,000 acres, and include the Quabbin Reservation – the largest single holding of state property in Massachusetts. The ecoregion contains significant acreages of land considered to be of high biodiversity value (e.g., areas identified by the BioMap and Living Waters assessments). With its abundant water resources and extensive tracts of forest, the LWP contains abundant fish and wildlife habitats and resources.

Large blocks of relatively contiguous forest cover still occur in many parts of the LWP ecoregion, due in large part to the relatively rural nature of the region, plus the large parcels of state-owned lands. However, development pressures are being felt in portions of the LWP, and a band of intensive “sprawl” activity is occurring just east of the ecoregion. It is likely that accelerated landscape fragmentation and associated loss of wildlife habitat will become a more serious issue in the near future.

Modern forest conditions are strongly influenced by past land use (particularly agricultural use dating from colonial times and subsequent farm abandonment), and a regional disturbance regime that is characterized by an intermediate to high occurrence of fire and hurricane winds. Presently, the majority of the LWP forest is classified as either Oak/Pine (approximately 39% of ecoregion) or Maple/Beech/Birch (35%). Hardwoods dominate the ecoregion forest, both in numbers of trees (72% of total) and volume of growing stock (67%).

Almost 72% of the LWP forest is classified as sawtimber, with 26% poletimber and only two percent in the seedling/sapling size classes. Dominant species include white pine (80% of softwood growing stock volume), northern red oak (28% of hardwood growing stock volume) and red maple (27%). Volumes of both white pine and northern red oak in the LWP are higher than statewide figures.

When the forest data is analyzed by diameter class, several trends are evident. First, red maple dominates the smaller diameter classes (about 32% of total volume), with white pine a distant second (about 20%). White pine dominates the larger diameter classes by far. Northern red oak, although relatively abundant in the middle size classes, represents only eight percent of the smallest diameter class, and is almost non-existent in the highest class (suggesting high harvest and/or mortality).

Overall, forest growth from 1984 through 1998 averaged 161.5 board feet per acre of timberland, with white pine accounting for 76% of the softwood growth, and northern red oak and red maple accounting for almost half of the total hardwood growth. Removals averaged 22.3 board feet, or 13.8% of growth. Hardwoods accounted for more than 81% of total removals; northern red oak (53%), other red oaks (23%), hemlock (12%) and white pine (7%) represented the dominant species harvested during the period.

Disturbance agents regularly impact forest conditions in the LWP. In addition to harvesting activity, other agents include storm events, insects, and diseases. Gypsy moth damage has been locally severe in the past. More recently, the hemlock wooly adelgid has the potential of substantially altering forest and habitat conditions in the ecoregion.

Water supply protection is an important management issue in the LWP, especially with the Quabbin Reservoir serving as the principle drinking water supply for more than 2.4 million Massachusetts residents. In addition, there are 34 other surface water reservoirs, as well as 146 ground water wells, in the ecoregion. Approximately three percent of the ecoregion is underlain by high or medium yield aquifers.

The estimated 2000 population of the LWP is 265,000 people. Many towns in the ecoregion have populations of less than 5,000. The highest population densities occur in the communities along the edges of the ecoregion. Build-out statistics indicate that the population in the 51 cities and towns in the LWP could more than double if all available buildable land was developed.

Residential development in most of the LWP towns is dispersed across the landscape, meaning that many residents live in close proximity to the forest. It also means that new development will further subdivide larger forested parcels into more, smaller ones. Still, with such a high percentage of the LWP undeveloped, forest-based outdoor recreation, as well as forest-based businesses, are important activities in the ecoregion.

Cultural resources, both prehistoric and historic, are abundant in the LWP. The region's wealth of waterways, including seven major river systems, provided local prehistoric populations with ample subsistence resources. Clusters of prehistoric sites on along the Swift and Quaboag rivers suggest that these areas were core settlement sites. The unusual history related to the creation of the Quabbin Reservoir has resulted in high historical significance to that area; indeed, more than 900 historic sites have been recorded and mapped in the former towns of the Quabbin. Finally, within the 51 communities in the LWP, there are 537 listings on the State Register of Historic Places, representing more than 1500 individual properties.

Based on the assessment of ecological and sociological conditions in the LWP, a number of issues were identified, from which management goals and recommendations were developed. These will help guide the development of future forest and land management plans for specific state-owned properties in the ecoregion. The main management goals for the LWP, by general category, include:

Conservation of Biological Diversity:

- *Enhance and expand the occurrence of contiguous blocks of early and late successional habitats, especially oak types, within the Ecoregion.*
- *Establish a network of forest reserves in the LWP Ecoregion that provides a wide range of ecological and social benefits.*
- *Protect the largest, most intact, biologically significant, or most-threatened forest blocks in the ecoregion.*

Forest Conservation:

- *Prevent new occurrences of non-native, invasive plant species and identify and control existing invasive threats to rare plant populations.*
- *Restore degraded forests (e.g., formerly high-graded stands, plantations, etc.) to a more natural and native condition.*
- *Minimize the impact of hemlock woolly adelgid on the forest within the ecoregion.*
- *Minimize high-grading by encouraging the application of sustainable forest management and conservation biology principles.*

Soil and Water Conservation:

- *Enhance the protection of the ecoregion's water supplies via improved land conservation and forest management.*
- *Reduce damage resulting from ORV/ATV activity within the ecoregion.*

Socio-Economic Factors:

- *Utilize existing state and federal renewable energy programs to support a significant biomass application within the ecoregion.*
- *Increase the amount of land enrolled in Chapter 61, the Forest Stewardship Program, or other programs that provide significant incentives for landowners to keep land in forest cover.*
- *Provide more equitable compensation to rural municipalities for the costs of having state lands within their communities.*
- *Strengthen the regional forest product economy by creating a more consistent and predictable flow of forest products to local forest industries.*
- *Assure the long-term protection of cultural resources in the LWP ecoregion.*

Another benefit of an ecoregion-based planning process is increased communication, coordination, and consistency among the three principle land management divisions within the Executive Office of Environmental Affairs. Representatives from the three divisions have worked together to assemble this assessment and to identify the issues, goals, and recommendations for the LWP. Further, this ecoregion document includes a “framework” for planning and implementing forest management on state lands within the LWP. That framework includes: 1) regulatory standards that apply to forest management activities in Massachusetts; 2) general guidelines on the development of management plans; 3) silvicultural standards that will guide forest management on state properties; and 4) contractual standards that apply to private loggers and other operators working on state lands.

A Landscape Assessment and Forest Management Framework for the Lower Worcester Plateau Ecoregion in Massachusetts

I. Introduction

Forests are much more than just trees. People rely on forests to provide building materials, heat for their homes, pure water and clean air, food and recreation, and other purposes vital to the health and economies of both individuals and societies. Further, they provide essential habitat for plant and animal species, retain genetic banks, protect rare/endangered species, and protect exemplary forest habitats. All of these values require a long-term perspective and stewardship of our forest ecosystems.

Increasingly, resource management agencies now make use of ecological classification systems, such as “ecoregions,” for land management planning. Ecoregions are portions of extensive landscapes with similar geology, physiography, vegetation, climate, and land use history. Such an approach both allows for the development of landscape-level goals and objectives, and also provides a logical framework for coordinating management activities among various agencies, organizations and other landowners.

This document is the beginning of a significant statewide effort to complete ecological assessments and provide regional guidance for the sustainable management of forests within the 14 ecoregions of Massachusetts. This effort, which will be completed over the next several years, is being led by the Executive Office of Environmental Affairs (EOEA), with active participation by the three principle Massachusetts land management divisions: the Division of State Parks and Recreation (DSPR), the Division of Fisheries and Wildlife (DFW), and the Division of Water Supply Protection (DWSP)². As an additional driver for the process, EOEA sought “green” certification of the sustainability of its forest management efforts, contracting with Scientific Certification Systems (SCS) to assess all state forestlands against the standards of the international Forest Stewardship Council (FSC). The certification process is detailed in a separate section below.

The goals of this new ecoregion-based planning effort are to:

- Identify current forest management issues and goals for each ecoregion.
- Improve the management of state-owned forestland by more closely linking management actions with the ecological and social conditions and issues in the landscapes in which they occur.
- Coordinate the planning and implementation of forest management activities on state lands under the care and control of the three principal land management divisions.
- Provide consistent opportunities for public input into the management of state-owned forestland in each ecoregion.
- Incorporate components into the forest management plans for state-owned properties, and other state programs, that offer incentives and technical assistance to private forest landowners regarding sound ecological stewardship of their forestland.
- Offer guidance to large non-state landowners (non-profit conservation organizations, forest industry, non-industrial private forestland owners, etc.) as to how their management practices can help address priority conservation issues in the ecoregion.

² The “Ecoregion Team” and primary authors of this document included: Robert O’Connor (EOEA), Paul Lyons (DWSP), John Scanlon (DFW), Thom Kyker-Snowman (DWSP), James DiMaio (DSPR), Mike Barry (DSPR), Mike Fleming (DSPR), Peter Church (DWSP), and Bruce Spencer (DWSP).

In delineating ecological regions for the state, staff from the three land-managing divisions reviewed formats established by the Environmental Protection Agency (EPA) and the United States Forest Service (USFS). Both systems are based on assessments of the geological, hydrological and/or biological features of the Massachusetts landscape. The Forest Service system is part of a nested classification system that covers the entire United States. The EPA system only includes Massachusetts. The Nature Conservancy (TNC) has adapted the Forest Service ecological regions in its “forest matrix” analysis of the Northeastern United States.

The ecoregion team considered the benefits of these two systems, as well as the locations of the 500,000 acres of state-owned forestland relative to the two formats. For areas from the main stem of the Connecticut River and its valley eastward to the coast, we felt the Forest Service system provided the best “fit” with the ecological conditions that agency staff know to exist in that part of the state. For areas to the west, the EPA system includes the finer delineations that we felt were necessary for effective management planning there. Rather than create a new “hybrid” classification system, we presented our case to USFS representatives, who agreed to make some modifications to their system that accommodated our concerns. As a result, we propose using the recently-revised USFS classification, which includes 14 ecoregions in Massachusetts (Figure 1). We also chose to subdivide two of these (i.e., the Taconic Mountains and the Hudson Highlands) where we felt landscape conditions were different enough within an ecoregion to warrant further subdivision for forest management planning purposes. Note that some additional minor modifications of these ecoregion boundaries might still be made in the future.

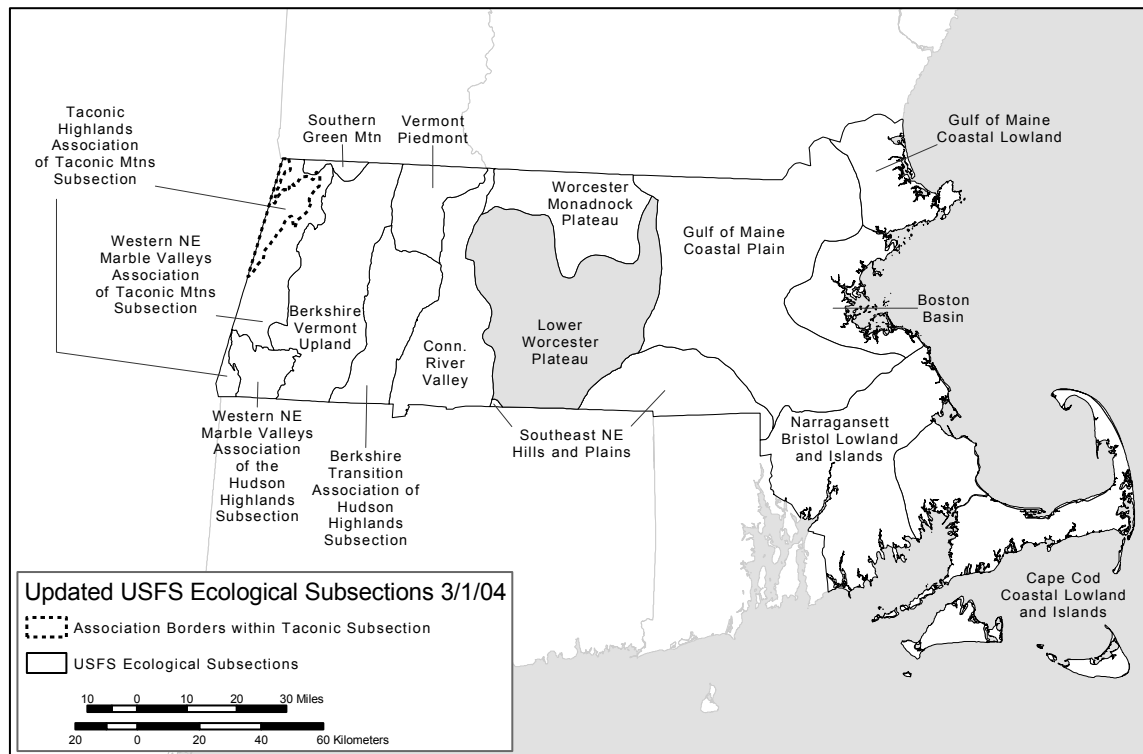


Figure 1. The proposed ecoregions of Massachusetts.

State-owned forestland includes state forests, wildlife management areas, and watershed reservations. Owned in common by the citizens of Massachusetts, these properties are unusual in the consistency and duration of their ownership and in the mandated exclusion of most types of development. Yet they are intimately linked to the dynamic landscape in which they exist. This

landscape includes physical, biological, and ecological features and processes, as well as socio-economic components and their fluctuations over time.

The state properties, as significant as they may be, exist within a matrix of private land, much of which is also forested, and which is equally significant from a landscape ecology perspective. About 2.3 million acres (76%) of the forestland in Massachusetts is privately owned. Statewide, almost 356,000 acres of private lands are enrolled in either Chapter 61 or Chapter 61A. In the LWP ecoregion communities alone, more than 91,000 acres are enrolled in these programs; an additional 21,500 acres are protected through Conservation Restrictions or Agricultural Preservation Restrictions.

Despite being separated by deeded property lines, the exchanges between state-owned forestland and the greater landscapes in which they occur are complex, ranging from positive but barely perceptible (e.g., the cleansing of air and water) to profound and visible (e.g., the introduction of the hemlock woolly adelgid and the consequent loss of a broadly-valued forest species). Further, these exchanges often involve human influences that are unbounded (e.g., long-term climate change).

Thus, the development of sustainable, long-range plans for the management of our state-owned forestland requires an understanding of the larger landscapes in which these forests exist. While natural resources managers have articulated this need more clearly in recent decades, much of the detail of landscape processes has yet to be discovered. We recognize up front that there are data gaps that restrict our ability to comprehensively describe current, and predict future landscape interactions. However, as those charged with managing the state forests to fulfill the range of citizen mandates for the use of these properties, we are, in the words of Yale silviculturalist David Smith, "condemned to act, on the basis of thoughtful judgment in the absence of total knowledge." We therefore present this effort as a work in progress, and invite the broadest public interaction as it moves forward, in order to fill the gaps and to better address the mandates associated with the landscapes of the Commonwealth and the management of the state-owned forestland.

For the most part, the issues raised in this document will be specific to the conditions of the Lower Worcester Plateau ecoregion. Some issues, however, may be common to multiple ecoregions. For example, improving the conservation of the more than two million acres of private, non-industrial forestland in the state is an issue that crosses ecoregional boundaries. The need for an improved "current use" forest legislation to broaden the enrollment of the current Chapter 61 legislation is one way to address this important issue. This legislation, in combination with other educational and technical assistance tools, is perhaps the most important statewide issue for the protection and sustainable management of the state's forestland.

The continued improvement of forest management on private forestlands, and especially the use of the state's Forest Cutting Practices Act as a tool to assist in this improvement, is another issue that crosses ecoregion boundaries. Recent policy changes by the DSPR (formerly DEM) regarding forest management on private lands will address that issue, although careful monitoring and future adjustments will also be needed. Still, it is generally acknowledged that the best opportunity to implement specific forest structure or habitat goals for Massachusetts' forestland lies with public lands, therefore, the primary focus of this document is to guide the coordination and improved management of the state-owned lands within the Lower Worcester Plateau Ecoregion.

Forest Certification

The concepts of forest sustainability and coordination of the management of state and other forests across ecological regions were recommended during the recent independent audit of the 500,000 acres of state-owned forestland by Scientific Certification Systems as part of the Forest Stewardship Council's Forest ("Green") Certification for these lands. Massachusetts is the first state

to put all of its state-managed forestlands up for certification. The audit, which took place in 2002 and early 2003, was launched with the following goals:

- Improve forest management on state lands based on state-of-the-art sustainable forest management principles.
- Improve coordination of forest management among the three land-holding EOEA divisions.
- Improve the confidence and understanding of the public about the management of the state's 500,000 acres of forests.
- Take advantage of potential value-added markets for "Green Certified" forest products sold on state lands.
- Educate the public about the role of sustainable forest management in providing local wood products and making Massachusetts more self-sufficient in the use of wood products.
- Encourage other landowners within Massachusetts to complete FSC Forest Certification on their lands to improve forest management across the state.

The FSC (www.fsc.org/fsc/) is recognized as the most credible provider of third-party certification of the sustainability of forest management practices. FSC does not conduct audits directly, but accredits other organizations to conduct them. In North America, the two FSC-accredited auditors are SmartWood, based in Vermont (www.smartwood.org) and Scientific Certification Systems in California (www.scscertified.com). SCS was chosen to conduct the Massachusetts audit through a competitive bidding process. SCS assessed Massachusetts' forest management practices against FSC's set of 10 Principles and associated Criteria by which all certified properties must be judged. In addition, FSC establishes regional guidelines in the form of Indicators. The current draft (7.7, June 2002) of the FSC Certification Standard for the Northeast Region of the United States is the FSC standard for Massachusetts.

As auditor for Massachusetts state forests, SCS also developed its own Standard for State Forestland in Massachusetts, modifying the SCS Generic Interim Standard to reflect state forest management in the region, and incorporating relevant components of the FSC Northeast regional standards. SCS also used its own Forest Conservation Program (FCP) criteria for the Massachusetts evaluation. The FCP was designed to directly reflect the FSC Principles and Criteria. All Massachusetts public forest operations were evaluated and scored on 18 SCS criteria within three program elements. These ratings were then translated into scores for each of the 10 FSC Principles.

The audit report, completed by a diverse team of nationally-known forest experts, is still in draft form, and will require FSC's final approval. This audit included field visits to over 70 sites where forest management practices had occurred or were planned on the properties of the three land-managing divisions within the EOEA.

One requirement that emerged from the certification process is the need for the development of forest management plans for state properties that are developed in the context of a landscape-level framework. Thus, EOEA and its land management divisions are moving forward with the completion of this first ecoregion document, which will guide forest management plans for the state properties within the LWP ecoregion. It should be noted however, that ecoregional planning is an adaptive process, and as new information becomes available, management guidelines and plans may change accordingly.